NEUROPHYSIOLOGICAL FACILITATION AND DIAPHRAGMATIC BREATHING EXERCISE IN IMPROVING CHEST EXPANSION OF GERIATRIC POPULATION

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

ELECTIVE – ADVANCED PT IN CARDIO RESPIRATORY DISEASE

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NEUROPHYSIOLOGICAL FACILITATION AND DIAPHRAGMATIC BREATHING EXERCISE IN IMPROVING CHEST EXPANSION OF GERIATRIC POPULATION

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SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR DEGREE OF "MASTER OF PHYSIOTHERAPY" AT THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY,
CHENNAI
(April 2011)

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1. INTERNAL EXAMINER

2. EXTERNAL EXAMINER

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DECLARATION

I hereby declare and present my project work entitled "**NEUROPHYSIOLOGICAL FACILITATION AND DIAPHRAGMATIC BREATHING EXERCISE IN IMPROVING CHEST EXPANSION OF GERIATRIC POPULATION"** The outcome of the original research work undertaken and carried out by me, under the guidance of Professor **Mr. B.KANNABIRAN**, **M.P.T, (Ph.D)., RVS COLLEGE OF PHYSIOTHERAPY,** Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the Tamil Nadu Dr. M.G.R Medical University.

SIGNATURE

ACKNOWLEDGEMENT

I express my sincere thanks to God, The almighty for providing me the strength and knowledge to complete my study successfully.

I acknowledge my sincere thanks to **CHAIRMAN and SECRETARY OF RVS EDUCATIONAL TRUST,** Sulur, and Coimbatore for providing me an opportunity to do this project.

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I offer my grateful thanks for all the staff members of RVS Hospital for extending support at the time of data collection.

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I offer my thanks and gratitude to our librarians for their supports in providing books to complete my study.

I take this golden opportunity to thank each and every patient who took part in this study for his kind co-operation and needed information.

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1. INTRODUCTION

Breathing is a complex behaviour which is governed by a variety of regulatory mechanism under the control of large part of central nervous system

Breathing exercise improves lung volume and lung capacities and the term “geriatrics” comes from the Greek *geron* meaning "old man" and *iatros* meaning "healer". However "Geriatrics" differs from gerontology, which is the study of the aging process itself. The by some as "Medical Gerontology"

In geriatric age group decrease in thoracic mobility also results in decreased vital capacity, this decline in pulmonary function can negatively impact on older individual’s ability to exercise

Neurophysiological facilitation and diaphragmatic breathing exercise given to thorax give attachment to the respiratory muscles.

Some of age related changes are: increase in rigidity of trachea and bronchi, decrease in elasticity of bronchial walls, decrease in cilia

Age related changes in respiratory muscles show increase in contraction and relaxation time and alteration in diaphragm position and efficiency

Changes in respiratory and pulmonary performance occur gradually allowing the elderly to continue to breathe effortlessly in the absence of pathological status. when the elderly are confronted with a little exersion or stress however, dysnea and other symptoms usually appear

The prominent effect of age related changes on the respiratory system is reduced efficiency in ventilation and gas exchange. The respiratory system includes

nose, pharynx, larynx, trachea, bronchi, bronchioles, alveolar duct and alveoli [Ebersole and Hess 1998]

NOSE

Nose is readily visible appendage, which with age elongates downward and it has been suggested that this age related changes may account for the mouth breathing that occurs while the elder sleep and thus the lack of saliva production [Saxon And Etten 1994]

TRACHEA

Stiffening of the larynx and tracheal cartilage occurs as a result of calcification. The cilia that line the trachea and help to push up mucus, debris and dust into the pharynx makes it less effective, cilia decrease in number with decrease in respiratory epithelium and increase in bronchial mucus gland hypertrophy [Shumman 1995]

CHEST WALL AND LUNGS

According to Tockman[1995] when a person reaches 55, his or her respiratory muscles start to weaken. Chest wall compliance began to decrease and there is loss of elastic recoil as a result of ventilation and gas exchangs are affected.

OXYGEN EXCHANGE

The aged blood oxygen level is approximately 75mmhg, whereas blood oxygen level of younger adult ranges from 90mmhg to 95 mmhg

RESPIRATORY PROBLEMS

According to Tockmann airway problems experienced later in life are due to repeated inflammatory injuries, disruption of inflammatory mediators and humeral protection and tissue repair.

The thorax or chest wall become less complain with age, meaning it gets stiffer because of calcification of the chondral cartilage or kypho scoliosis. This results in the chest wall becoming fixed in slight expanded position from which there is restriction in its ability to expand outward further or to contract inward. During normal breathing rib cage expansion accounts for about 40% in adult but only 30% in elderly (Rossi et al., 1996).

The muscles of thoracic cage are the only skeletal muscles that must contract on a regular basis throughout the life span (Rossi et al., 1996).

The strength of an old adults diaphragm is noted to about 28% less than the young adult (Enright, 1999).

Whether cross linkage or changes in location and orientation of the individual elastic fibers within the lung (De martinis and timiras, 2003, culver and butler, 1985. Sparrow and Weiss, 1988).

The alveolar ducts to become enlarged and the alveoli to fallen this results in more over staying within the alveolar duct rather than within the alveoli where oxygen exchange is more efficient (Demartins and Timiras, 2003).

Elderly people are at an increased risk for lung infection and the body has many ways to protect against lung infection with aging, these defenses may weaken.

The cough reflex may not trigger readily and the cough may be less forceful the hair like protection that line the airway cilia, are less able to move mucus up and out of the airway.

1.1 AIM AND NEED OF STUDY

There are many biological researches done on neural control of respiration hence there is need of clinical implication to assist the integrity of such biological research

It is needed to evaluate effectiveness of neuro physiological facilitation of respiration which can be evaluated by chest expansion

It is needed to evaluate effectiveness of diaphragmatic breathing exercise which can be evaluated by chest expansion

1.2 STATEMENT OF THE STUDY

This a study on the effect of neurophysiological facilitation and diaphragmatic breathing exercise in improving chest expansion of geriatric population

1.3 HYPOTHESIS

Null hypothesis

There is no significant effect of neurophysiological facilitation technique compared with diaphramtic breathing technique in improving chest expansion, peak expiratory flow rate, and inspiratory capacity.

Alternative hypothesis

There is significant effect of neurophysiological facilitation technique compared with diaphramtic breathing technique in improving chest expansion, peak expiratory flow rate, and inspiratory capacity.

1.4 OPERATIONAL DEFINITION

1. Diaphragmatic breathing exercise

- A breathing exercise that emphasizes the contraction and release of the diaphragm muscle to fully inflate the lung, there by engaging the muscle of the back and abdomen [by Marguerite Agle october29,2008]

2. Neurophysiological facilitation

- Neurophysiological facilitation of respiration is the use of selective external proprioceptive and tactile stimuli that produce reflexive movement response in the ventilator apparatus to assist respiration

3. Chest expansion

- Chest wall expansion was defined as a circumferential measurement of chest wall where recorded in centimeter using rectractable tape

4. Peak expiratory flow rate

- Peak flowmeter measures the patient's maximum speed of expiration or expiratory flow rate

5. Inspiratory capacity

- The volume of gas that can be taken into the lungs in a full inhalation, starting from the resting inspiratory position; equal to the tidal volume plus the inspiratory reserve volume.

2. REVIEW OF LITERATURE

1. **Joy Varghese[2009]** the effectiveness of the neurophysiological facilitation of respiration technique with chest physiotherapy technique in respiratory care of people with intellectual disability

2. The PNF technique was found to be the main contributors to improvement in spo2 for subject with myotonic dystrophy [**dr. Jennifer** article published on online 29th march 2006,volume-7,issue-4 page 228-238]

3. Inter costal stretch alter breathing pattern and respiratory muscle activity in conscious adult [volume 88, issue 2, February 2002, page 89-97**. T. Pakree. FCerny and b.Bishop**

4. **Jennifer and Ammani [2001]** the proprioceptive and tactile stimuli selected produce remarkable consistent reflexive response in ventilator muscles

5. **Tucker et al [1999]** suggest that there is an increase in chest wall movement and increase in lung volume

6. **Miller et al [1997]** have considered the many neural structures that can potentially modifies the final output of the ventilatory muscles

7. **Duron and rose [1997]** afferent input that activates the dorsal intercostal muscle is consistent where every intercostal space the dorsal part of external [inspiration] and the dorsal part of internal [expiration] intercostal muscles are antagonistic during quite breathing

8. **Destroyer [1997]** inspiratory force of the diaphragm is also related to its opposition to the rib cage.

9. **Frazier et al 1997, Hilaire and Monteau 1997** afferent information from the lower intercostals and the abdominal muscles may facilitate phrenic motar neuron by a spinal reflex . emerging evidence suggest that phrenic afferent are more involve in respiratory regulation during stress breathing

10. **Richer et al [1997]** efferent axons from the medullary neurons project to the inspiratory neurons in the spinal cord

11. **Frozer et al [1997]** states that respiratory drive is regulated by information from sensory receptor within the airways ,lungs and respiratory muscles as well as central and peripheral chemoreceptor

12. **Hilare et al [1997]** emerging evidence suggested that phrenic nerve are more involve in respiratory regulation during stress breathing

13. **James E zachazewski [1996]** PNF techniques are used to place specific demand promoting or hastening the response of tissue through the use of stimulation of proprioceptor

14. **Carolyn kisner [1996]** has given the result that the diaphragmatic breathing exercise is improving ventilation and chest expansion

15. **Scand j.t [1995]** states that any exercise given to diaphragm, moblises chest wall and improves ventilation

16. **Vibekk[1991]** pilot studies have shown improvement in lung function in subject with cystic fibrosis using these techniques

17. **Green and morhan [1985]** breathing control in normal tidal breathing using lower chest with relaxation of upper chest and shoulder .diaphragm work to improve the work of inspiratory muscles

18. **Hamberg and lindahi [1981]** have shown improvement in chest wall pain due thorasic spine disorder followed by these techniques

19. **Menkes and traysman [1977]** breathing is regulated by a multiple of reflex, negative feedback circuit and feed forward mechanism

20. **Bethene [1975 and 1976]** neurophysiological facilitation of respiration is the use of selective external proprioceptive and tactile stimuli that produce reflexive movement response in ventilator apparatus to assist respiration .the response they elicit appear to alter the rate and depth of breathing

21. **Sumi[1973]** studies tactile and pressure receptor in the cat and reported thorasic cutaneous fields for both inspiratory and expiratory motar neurons he proposed the local cutaneous stimulus of the thorasic would then tend to reflexively produce an inspiratory position of rib cage

22. **Franstin [1970]** experiment with decerebrate in cat have demonstrated that there is increase muscle tone also involves the intercostals muscles providing the respiratory muscle also obeys brain stem mechanism

23. **Voss [1967]** tactile cules on PNF are mainly provided by therapist manual contact which facilitate movement through or promote relaxation, manual contact must applied to agonist to facilitate maximal response

24. **Eklud et al [1964]** demonstrated reflex effect on intercostal motar activity in response to stimulation of artery from overlying skin

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Research design

The research design of this study is experimental, comparative in nature

3.2 Settings

The study was conducted in RVS hospital

3.3 Criteria for selection

3.4 Inclusion criteria

- Geriatric Population
- Only Males
- Age Above 60 -70Years

3.5 Exclusion criteria

- subject with recent rib fracture
- patient with coronary disease
- patient with recent surgery
- patient with systemic illness

3.6 Sample population

30 subject and 15 in each group

3.7 Method of sampling

Random sampling technique

3.8 VARIABLE USED IN THE STUDY

Independent variable

- Diaphragmatic breathing exercise
- Neurophysiological facilitation

Dependent variable

- Chest expansion
- Peak expiratory flow rate
- Inspiratory capacity

3.9 METHODOLOGY

30 subject are selected and divided into two groups

The procedure was explained to subject

Group A- treated with diaphragmatic breathing exercise

Group B- treated with neurophysiological facilitation technique

Hence both the group are treated and after 10 days chest expansion measured along with peak expiratory flow rate and inspiratory capacity

TECHINIQUES

DIAPHRAGMATIC BREATHING EXERCISE

- Prepare the patient in relaxed and comfortable position in which gravity assist the diaphragm such as semi reclining position
- If your examination reveals that the patient initiate the breathing pattern with the accessory muscles of respiration.
- Start instruct by teaching the patient how to relax those muscles[shoulder rool or Shoulder shrugle coupled with relaxation place your hand on the rectus abdominal muscle just below the anterior costal margin ask the patient to breathe slowly and deeply through the nose. Have the patient keep the shoulder relaxed and upper chest quite allowing the abdomen to rise slightly then tell the patient to relax and exhale slowly through the mouth.

- Have the patient practice this 3or 4 times and then rest. Do not allow the patient to hyperventilate
- If the patient is having difficulty in using the diaphragm during inspiration have the patient inhale several times in succession through nose by using sniffing action this action used to facilitate diaphragm

NEURO PHYSIOLOGICAL FACILITATION TECHINIQUE

1. Inter costal stretch

Intercostal stretch is provided by applying pressure to upper border of rib in a direction that will widen the space above it pressure should be applied in downward direction not inward, stretch is maintained as the patient continues to breathe in his usual manner, as the stretch is maintained, a gradual increase in inspiratory movement in and around area being stretched occur.

When performing over an area of instability as in presence of paradoxical movement of upper rib cage or over decrease mobility. This procedure is effective in restoring normal breathing pattern where epigastric excursion can be observed and increase in area being stretched. This represents reflexive activation of diaphragm by intercostal afferent that innervate its margin.

2. Vertebral pressure

Position of patient: Supine lying

Procedure: A firm pressure is applied directly over the vertebrae of upper and lower thoracic cage activates dorsal intercostal muscles, pressure should be appl;ied with open hand and must be firm enough to provide some stretch.

i) Vertebral pressure high

- Manual pressure to upper thoracic vertebrae $T_2 – T_5$
- Response obtain was increase in epigastric excursion.
- Deep breathing

ii) Vertebral pressure low

- Pressure over lower thoracic vertebrae T7- T 10
- Response obtain was increase in respiratory movement of apical thorax.

3. Anterior stretch lifting posterior basal area

Position of patient: Supine lying

Procedure:

- Placing t he hands under ribs and lifting gently upward.
- The lift is maintained and provides a maintained stretch and pressure posteriorly and anterior stretch.
- Response obtain as a result the lift is sustained and stretch is maintained and increase in movement of ribs in lateral and posterior direction can be seen and felt, increase in epigastric movement and expansion of posterior basal.

4. Maintained manual pressure

From contact of open hands is maintained over an area in which expansion is desired gradual increase in excursion of ribs under contact will be felt.

This is useful procedure to obtain expansion in any situation where pain is present for instance when there is chest tubes or cardiac surgery which may have required splinting of sternum.

Manual contact over the posterior chest wall is also useful and comfortable for person with chronic obstructive pulmonary disease.

5. Perioral pressure

Perioral stimulation is provided by applying firm maintained pressure to the patient top lip being carefully not to occlude the nasal passage (the use of surgical gloves to avoid contamination) the response to this stimuli is brief for 5 seconds a period of apnea followed by increase in epigastric excursion.

Pressure is maintained for the length of time the therapist wishes the patient to breath in active pattern.

As the stimuli is maintained the epigastric excursion may increase so that movement is transmitted to the upper chest and the patient appears to deep breathing.

6. Co – contraction of the abdomen

Pressure is applied simultaneously over the patent's lower lateral ribs and over the ilium in direction right angle to the patient.

Moderate force is applied and maintained roods believe that this procedure increase tone in abdominal muscles and activates diaphragm.

The response obtain are depression of umbilicus, as the pressure is maintained increase abdominal tone is seen and palpated, in the presence of retained secretion abdominal contraction may produce coughing (as ventilation increase cough can occur in any procedure), in obese abdominal co-contraction has frequently result in decrease abdominal girth.

PROCEDURE	METHODS	OBSERVATION
1.PERIORAL PRESSURE	Pressure is applied to the patients toplip by the therapist fingers and maintained	Increase epigastric excursion, Deep breathing, Mouth closure, Swallowing,
2.[1]VERTEBRAL PRESSURE HIGH	Manual pressure to thoracic vertebrae in region of T2-T5	Increase epigastric, exursion
2[2].VERTEBRAL PRESSURE LOW	Manual pressure to thoracic veretebrae In region of T7-T10	Deep breathing, Increased respiratory Movement of apical thorax
3.ANTERIOR STRETCH LIFTING POSTERIOR BASAL AREA	Patient supine Hands under lower ribs lifting upward	Expansion of posterior basal area
4.CO-CONTRACTION OF ABDOMEN	Pressure laterally over ribs and pelvis Alternate right and left side	Increasing epigastric movement, increase muscle contraction, decrease girth in obese
5.INTERCOSTAL STRETCH	Stretch on expiratory phase maintained	Increase movement of area being stretched
6. MAINTAINED MANUAL PRESSURE	Moderate pressure of open hands	Gradual increase of area under contact

3.10 MEASURING TOOL

Inch tape

Peak flow meter

Incentive spirometer

CHEST EXPANSION

Chest expansion measured with a measuring tape in 3 levels

1. Axillary

2. Nipple

3. Xiphisternum

The measurement is taken at full inspiration and at full expiration

The measurement at expiration-the measurement at inspiration gives the amount of chest expansion.

PEAK FLOW METER

A peak flow meter measures the patient maximum speed of expiration or expiratory flow rate

PROCEDURE

1. Make sure the peak flow meter reads zero
2. Stand up right
3. The mouth piece should be cleaned with antiseptic in each use
4. Form a tight seal with the lips around the mouth piece
5. Take a deep breath
6. Blow as hard and as fast as the person can until all the air is gone from the lungs

7. If the patient cough or make mistake, just repeat.
8. In between each attempt, make sure the peal flow meter reads zero
9. Take some deep breath between peak flow attempts if the person feels dizzy. Stop the testing and sit down for few minutes before continuing.
10. Do not put the tongue inside the hole do not cover the hole and the back of the peak flow meter when holding it.
11. Record the readings shown in peak flow meter.

INCENTIVE SPIROMETER

PROCEDURE

1. Hold the incentive Spiro meter upright
2. Breath out normally, close your lips tightly around the mouth piece and inhale slowly through your mouth. This slow deep breath will raise the ball in clear chamber of the Spiro meter
3. Continue to breath in, trying it raise the ball as high as you can. Read the volume that you have achieved by raise in ball
4. When you feel like you cannot breathe in any longer, take your breath for3to 5 seconds then breathe out slowly
5. After you have taken 10 deep breaths on your incentive Spiro meter, it is important to cough to try to remove secretion that build up in your lungs
6. Incase of surgery splint your incision with pillow or blanket.
7. Measure the level of raise in ball during breath.

4. DATA ANALYSIS AND INTERPREATION

The data collected was subjected to paired‘t’ test individually for group A and group B using formulas.

Formula 1

$$\bar{d} = \sum d/n$$

Where,

d = difference between pre test and post test values

$\bar{d}$ = is the mean value of d

n = is the number of subjects

Formula 2:

Standard deviation SD = $\sqrt{\frac{\sum (d-\bar{d})^2}{(n-1)}}$

Formula 3:

Standard Error (S.E) = $\frac{SD}{\sqrt{n}}$

‘t’ calculated value = $\frac{d}{S.E}$

Formula 4:

‘t’ cal = $\frac{d}{S.E}$

Where, t cal is the t calculated value

INDEPENDENT‘t’ TEST

Formula 1: $$S=\sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)\, s_2^2}{n_1+n_2\ -2}}$$

Where, s is the standard deviation

n_1 - is the number of subject in group A

n_2- is the number of subject in group B

s_1 - is the standard deviation of group A

s_2 is the standard deviation of group B

Formula2

$$S.E = S\sqrt{{}^1/n_1^2 + {}^1/n_2^2}$$

Where, s - is the standard deviation

S.E. - is the standard error

Formula 3

$$\text{‘t’ cal} = \frac{\overline{X_1} - \overline{X_2}}{S.E}$$

Where, X_1 is the average of difference in values between pretest and post test

X_2 is the average of difference in values between pretest and post test

Paired T test [comparison of pretest and posttest mean]

Paired‘t’ test

1. Chest expansion

TABLE - 1

Axillary level

Subject	Chest expansion	
	Group A	**Group B**
Pretest mean	1.13	1.46
Posttest mean	2.6	2.73
S.D	0.5168	0.4582

In group A the mean chest expansion for (axillary level), pre test value was 1.1 and post test value was 2.6 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 10.491 which is greater than ‘t’ value and in group B the mean chest expansion for (axillary level), pre test value was 1.46 and post test value was 2.73 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 10.650 statistically significant

TABLE - II

Nipple level

Subject	Chest expansion	
	Group A	**Group B**
Pretest mean	1.93	2.00
Posttest mean	3.06	3.33
S.D	0.4423	0.4884

In group A the mean chest expansion for (Nipple level), pre test value was 1.93 and post test value was 3.06 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 9.894 which is greater than 't' value and in group B the mean chest expansion for (Nipple level), pre test value was 2.00 and post test value was 3.33 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 10.546, statistically significant

TABLE - III

Xiphisternal level

Subject	**Chest expansion**	
	Group A	**Group B**
Pre test mean	2.46	2.53
Post test mean	3.46	3.93
S.D	1.2489	0.5731

In group A the mean chest expansion for (Xiphisternal level), pre test value was 2.46 and post test value was 3.46 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 3.7213 which is greater than 't' value and in group B the mean chest expansion for (Xiphisternal level), pre test value was 2.53 and post test value was 3.93 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 9.4611, statistically significance

2. Peak expiratory flow rate

TABLE – 1V

Subject	Peak expiratory flow rate	
	Group A	**Group B**
Pre test mean	130.33	113
Post test mean	148	122
S.D	4.5512	7.7451

In group A the mean peak expiratory flow rate pre test value was 130.33 and post test value was 148 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 14.467which is greater than 't' value and in group B the mean peak expiratory flow rate pre test value was 113 and post test value was 122 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 11.001 and 't' calculated value is 9.4611, statistically significant

3. Inspiratory capacity

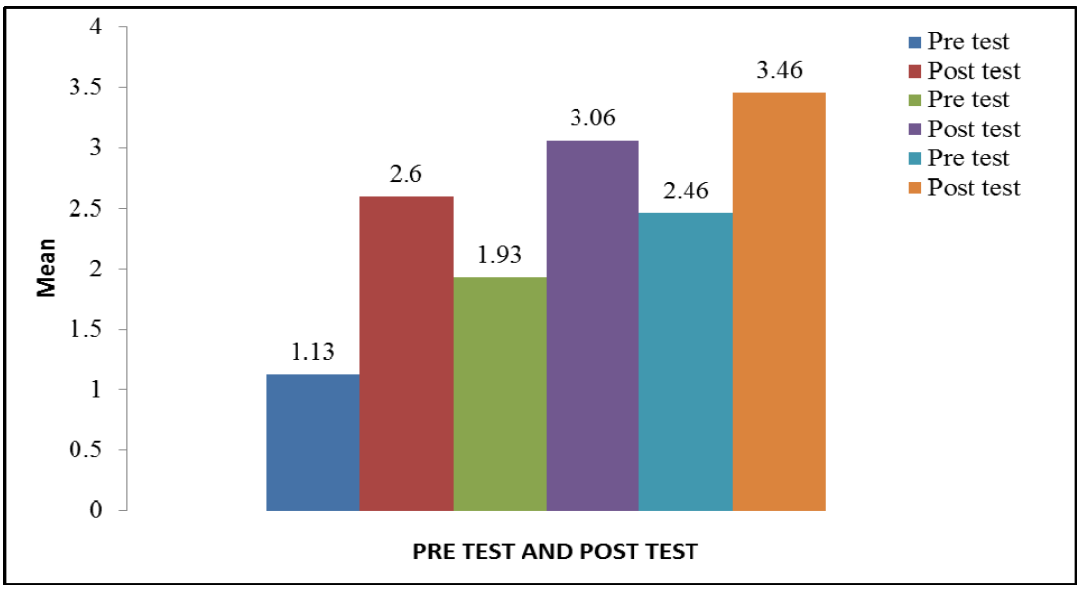
TABLE - V

Subject	Inspiratory capacity	
	Group A	**Group B**
Pre test mean	1.2	1.26
Post test mean	2.6	2.86
S.D	0.5731	0.5209

In group A the mean inspiratory capacity pre test value was 1.2 and post test value was 2.6 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 9.4611 which is greater than ‘t’ value and in group B the mean inspiratory capacity pre test value was 1.26 and post test value was 2.86 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 11.375, statistically significant

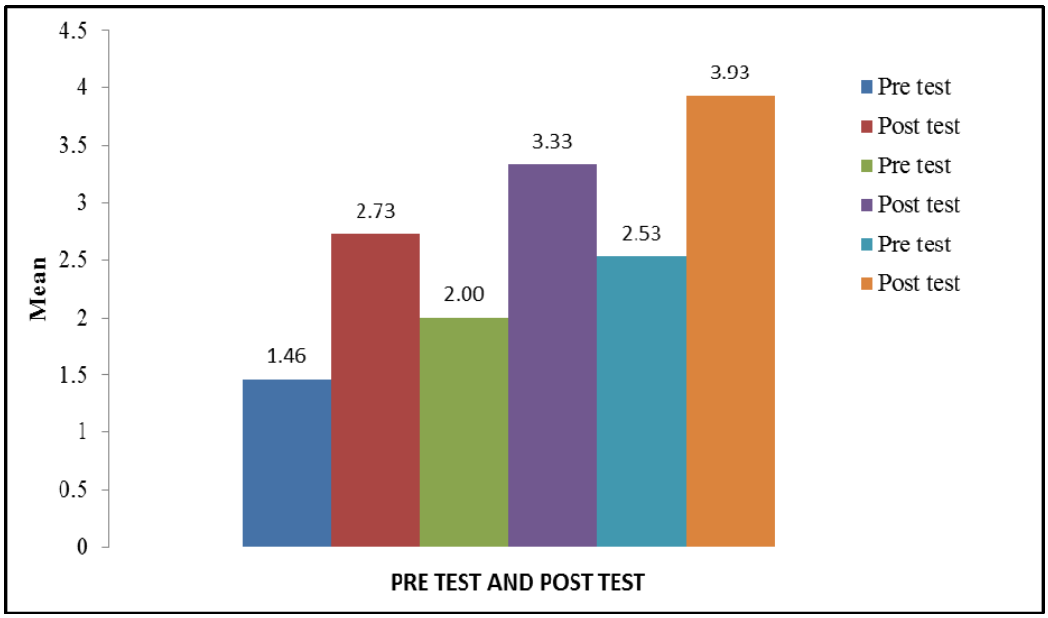
GRAPH- I

GROUP – A (Chest Expansion: Axillary, Nipple, Xiphisterinal level)



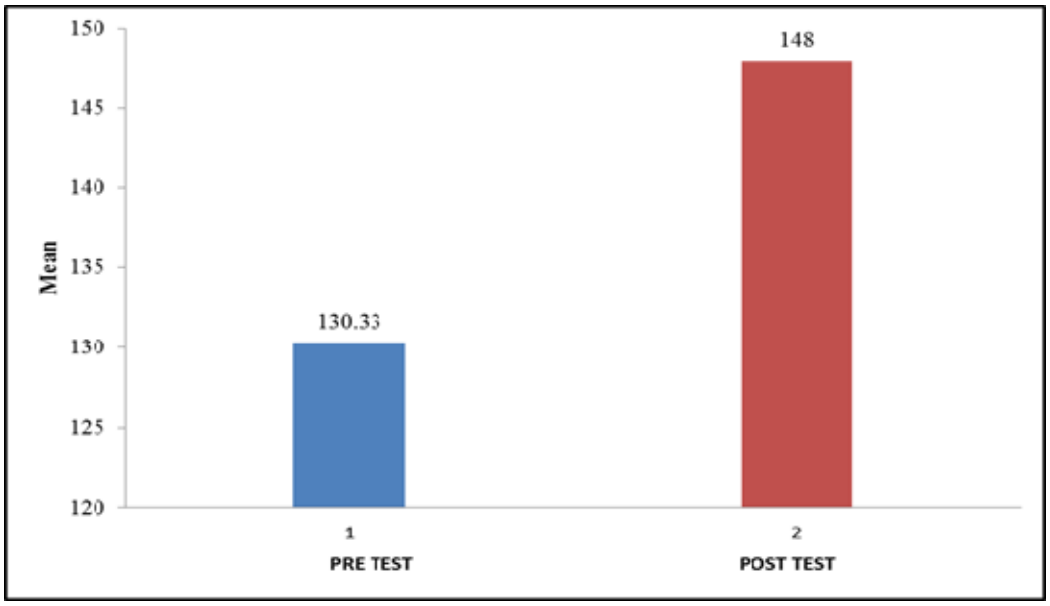
GRAPH-II

GROUP – B (Chest Expansion: Axillary, Nipple, Xiphisterinal level)



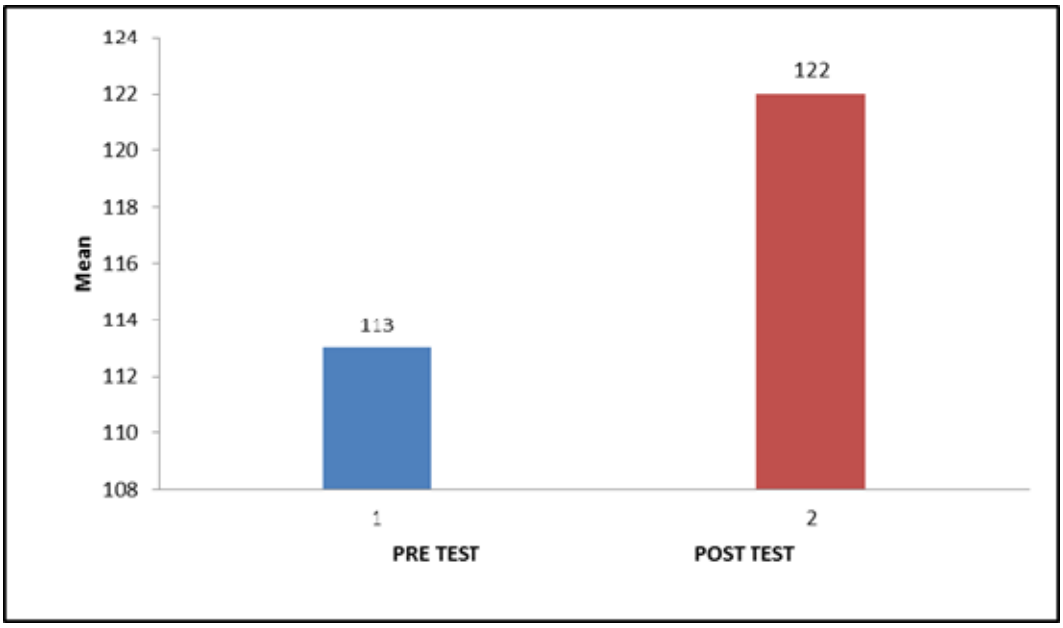
GRAPH-III

GROUP –A (Peak Expiratory Flow Rate)



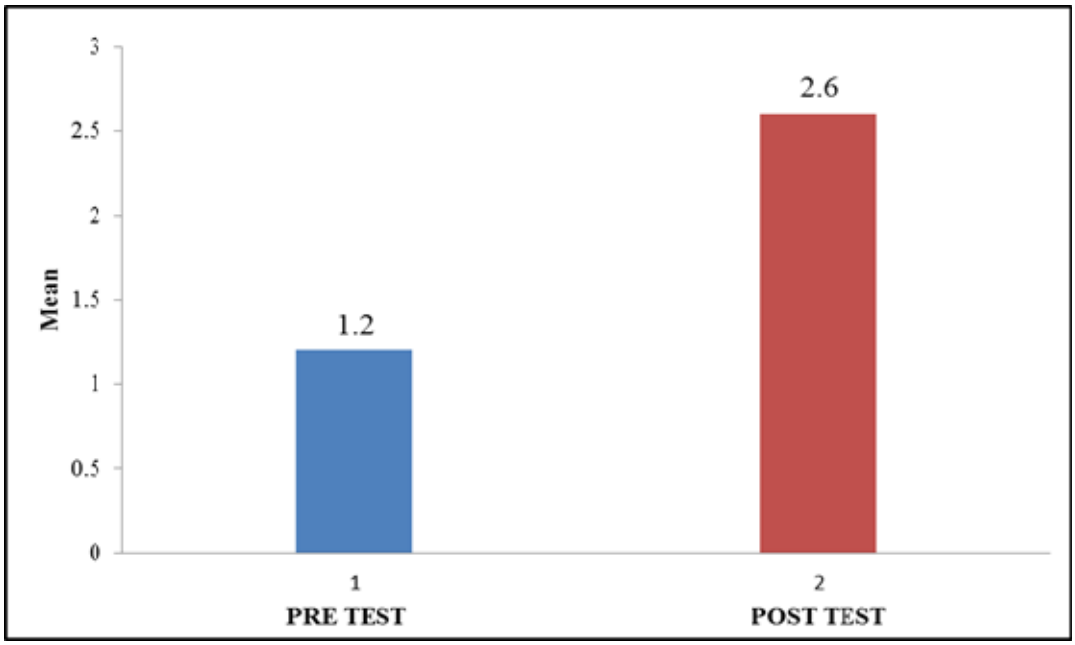
GRAPH-IV

GROUP –B (Peak Expiratory Flow Rate)



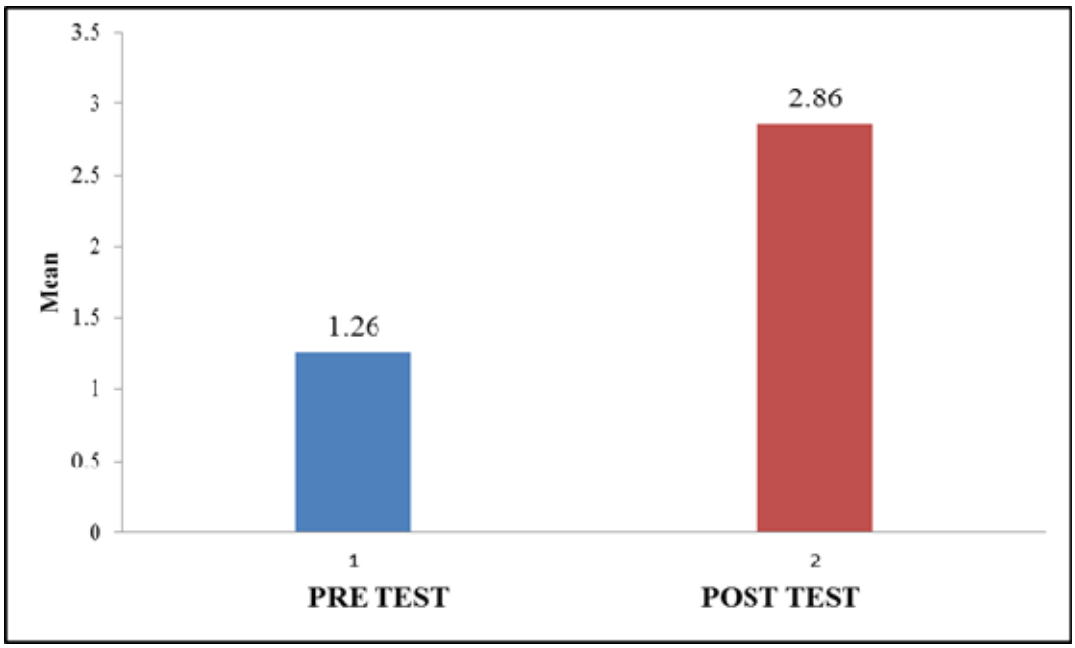
GRAPH-V

GROUP –A (inspiratory capacity)



GRAPH-VI

GROUP –B (inspiratory capacity)



Independent 't' test

1.**Chest expansion (axillary level)**

TABLE - VI

Subject	Neurophysiological facilitation VS diaphragmatic breathing exercise	
	Group A	**Group B**
Post test mean	2.6	2.73
Independent 't' test	0.7865	

The independent't' test value for chest expansion (axillary level) is 0.78650 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

2. Chest expansion (Nipple level)

TABLE - VII

Subject	Neurophysiological facilitation VS diaphragmatic breathing exercise	
	Group A	**Group B**
Post test mean	3.06	3.33
Independent 't' test	1.1751	

The independent't' test value for chest expansion (Nipple level) is 1.1757 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

3. Chest expansion (Xiphisternal level)

TABLE - VIII

Subject	Neurophysiological facilitation VS diaphragmatic breathing exercise	
	Group A	**Group B**
Post test mean	3.46	3.93
Independent 't' test	0.5641	

The independent't' test value for chest expansion (Xiphisternal level) is 0.5641 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

4. Peak expiratory flow rate

TABLE - IX

Subject	Neurophysiological facilitation VS diaphragmatic breathing exercise	
	Group A	**Group B**
Post test mean	148	122
Independent 't' test	0.0555	

The independent 't' test value for peak expiratory flow rate is 0.0555 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

4. Inspiratory capacity

TABLE - X

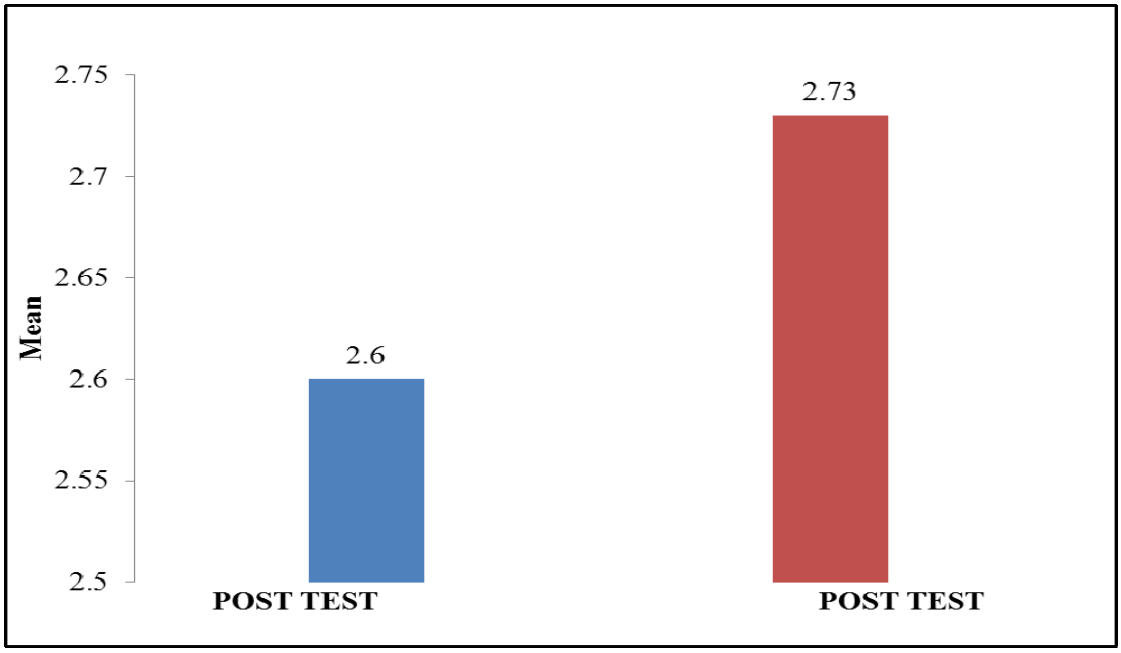
Subject	**Neurophysiological facilitation VS diaphragmatic breathing exercise**	
	Group A	**Group B**
Post test mean	2.6	2.86
Independent 't' test	0.6509	

The independent 't' test value for inspiratory capacity is 0.6509 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

Independent‘t’ test

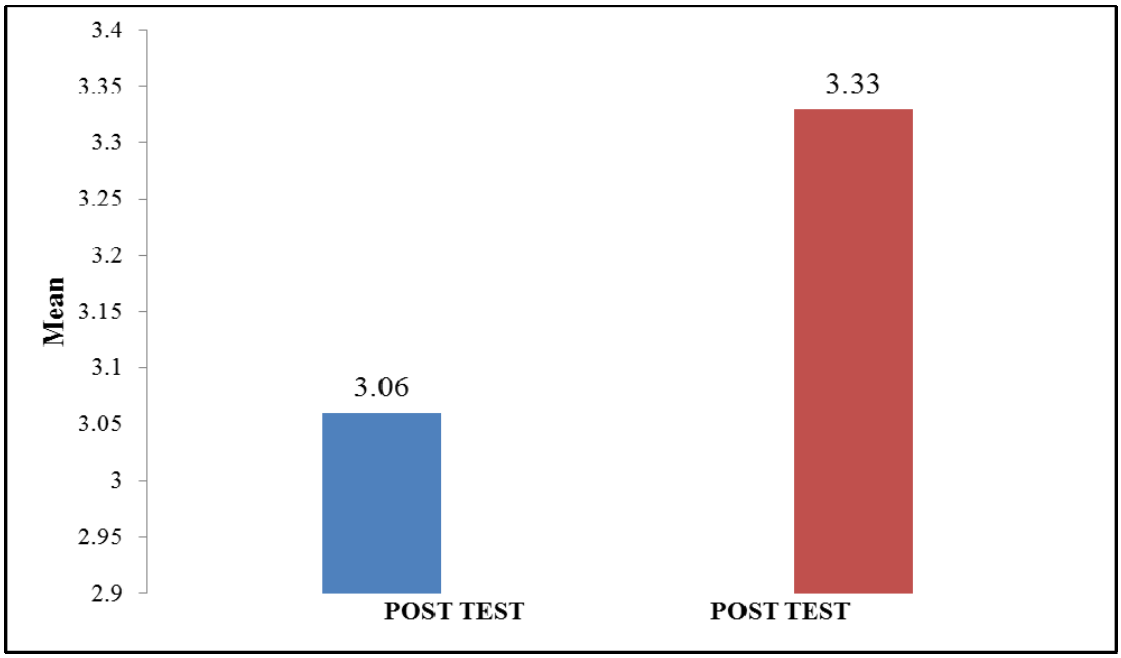
GRAPH-VII

1.Chest expansion (axillary level)



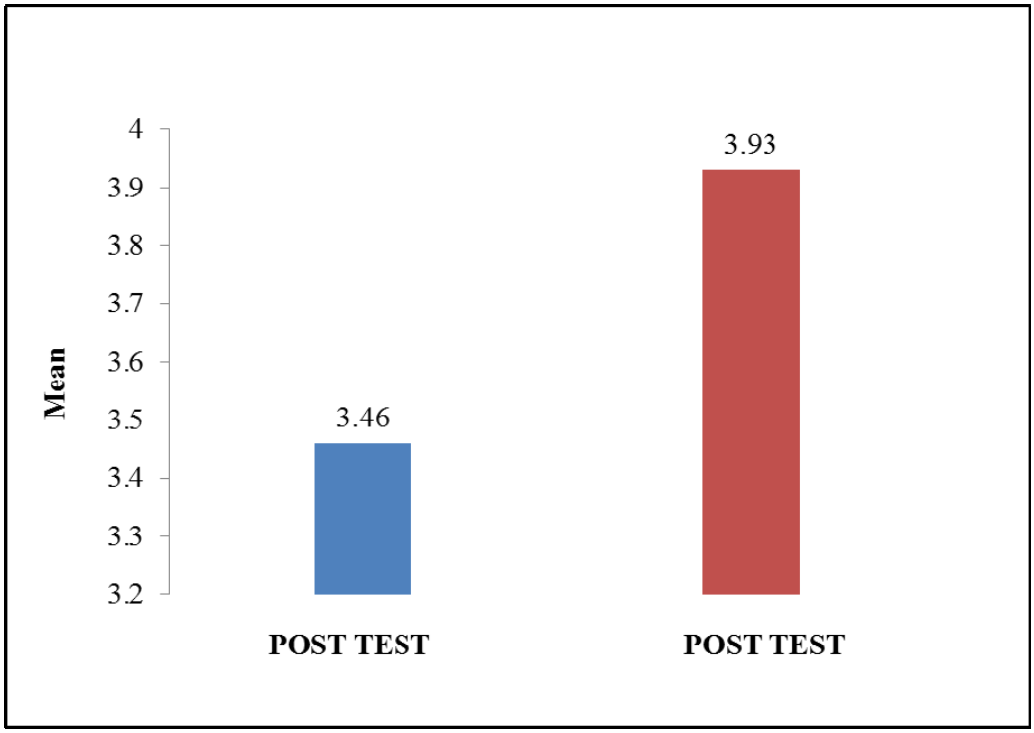
GRAPH- VIII

2.Chest expansion (Nipple level)



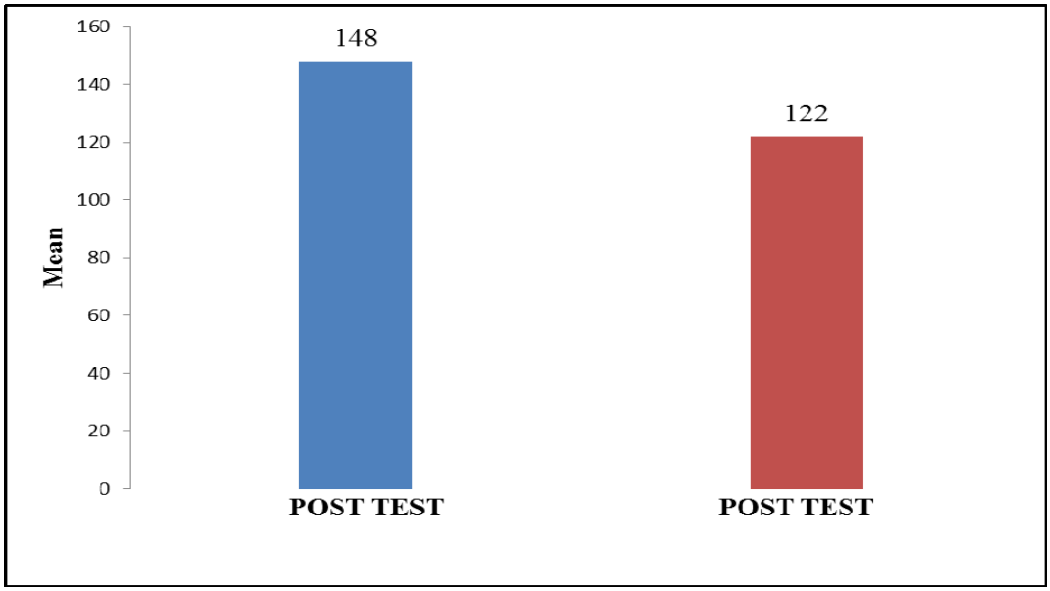
GRAPH- IX

3.Chest expansion (Xiphisternal level)



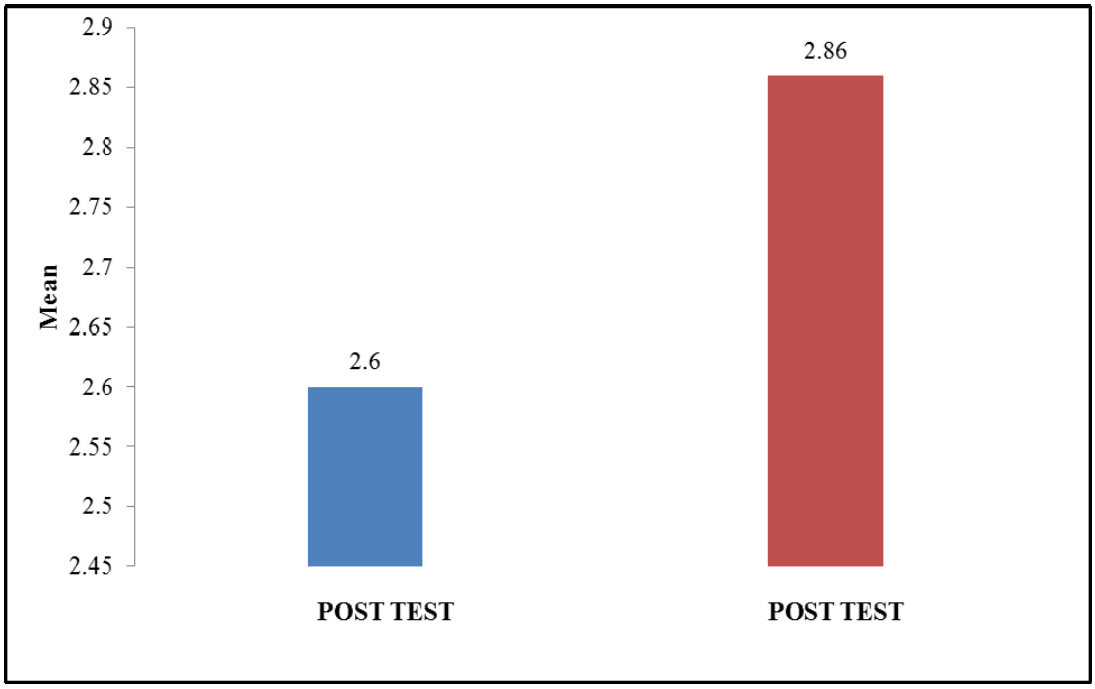
GRAPH-X

4.Peak expiratory flow rate



GRAPH-XI

5. Inspiratory capacity



INTERPRETATION OF DATA

Calculated value of paired‘t’ test for group A [chest expansion]

•Axillary level- T= 10.491

•Nipple level – T= 9.894

•Xiphisternal level- T= 3.7213

Calculated value of paired T test for group B [chest expansion]

•Axillary level- T= 10.650

•Nipple level- T= 10.546

•Xiphisternal level- T= 9.4611

Calculated value of paired T test for group A [peak expiratory flow rate]

T= 14.467

Calculated value of paired T test for group B [peak expiratory flow rate]

T= 11.001

Calculated value of paired T test for group A [inspiratory capacity]

T= 9.4611

Calculated value of paired T test for group B [inspiratory capacity]

T = 11.375

Calculated T value is greater than T table value

1.Calculated value of independent T test for chest expansion

- Axillary level- T= 0.7865
- Nipple level- T = 1.1757
- Xiphisternal level- T= 0.5641

2. Calculated value of independent T test for inspiratory capacity

T= 0.6509

3 Calculated value of independent T test for peak expiratory flow rate

T= 0.0555

Calculated T value is less than T table value

5. RESULT

The pre test and post test values of the groups were analyzed using paired‘t’ test and independent ‘t’ test.

In group A the mean chest expansion for (axillary level), pre test value was 1.1 and post test value was 2.6 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 10.491 which is greater than ‘t’ value.

In group B the mean chest expansion for (axillary level), pre test value was 1.46 and post test value was 2.73 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 10.650 which is greater than ‘t’ value.

In group A the mean chest expansion for (Nipple level), pre test value was 1.93 and post test value was 3.06 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 9.894 which is greater than ‘t’ value.

In group B the mean chest expansion for (Nipple level), pre test value was 2.00 and post test value was 3.33 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 10.546 which is greater than ‘t’ value.

In group A the mean chest expansion for (Xiphisternal level), pre test value was 2.46 and post test value was 3.46 for 14 degree of freedom at 0.05 level of significance, the ‘t’ table value is 2.145 and ‘t’ calculated value is 3.7213 which is greater than ‘t’ value.

In group B the mean chest expansion for (Xiphisternal level), pre test value was 2.53 and post test value was 3.93 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 9.4611 which is greater than 't' value.

In group A the mean peak expiratory flow rate pre test value was 130.33 and post test value was 148 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 14.467which is greater than 't' value.

In group B the mean peak expiratory flow rate pre test value was 113 and post test value was 122 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 11.001 and 't' calculated value is 9.4611 which is greater than 't' value.

In group A the mean inspiratory capacity pre test value was 1.2 and post test value was 2.6 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 9.4611 which is greater than 't' value.

In group B the mean inspiratory capacity pre test value was 1.26 and post test value was 2.86 for 14 degree of freedom at 0.05 level of significance, the 't' table value is 2.145 and 't' calculated value is 11.375 which is greater than 't' value.

The independent 't' test value for chest expansion (axillary level) is 0.78650 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

The independent 't' test value for chest expansion (Nipple level) is 1.1757 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

The independent‘t’ test value for chest expansion (Xiphisternal level) is 0.5641 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

The independent‘t’ test value for peak expiratory flow rate is 0.0555 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

The independent‘t’ test value for inspiratory capacity is 0.6509 respectively for 28 degree of freedom at 0.05 level of significance and critical table value is 2.048 there fore there is no significant difference in both the group.

Hence we are going to accept null hypothesis and reject alternate hypothesis

6. DISCUSSION

According to t.pacree F cerny and B bishop intercostal stretch alter breathing and respiratory muscles

This study has been supported by above literature in improving chest expansion following intercostals stretch

In this study following diaphragmatic breathing exercise there is an improvement in chest expansion

Improvement of peak expiratory flow rate, inspiratory capacity, chest expansion in both the group following diaphragmatic breathing exercise and neurophysiological facilitation

Age related physiological changes in geriatric people are the main cause of restriction in chest expansion

7. SUGGESTION

- The study can be done with large number of sample
- study can be conducted in patients with restrictive lung disease where the chest expansion is reduced
- intercostal stretch can be done in patient with paradoxical upper rib cage movement
- Maintained manual pressure can be applied in patient with pain after cardiac surgery
- Manual contact can be applied over posterior chest wall in patient with chronic obstructive pulmonary disease

LIMITATION

- Environmental factor
- Occupational hazards
- Current physical performance
- Smoking and alcoholism

8. CONCLUSION

There is significant improvement in improving chest Expansion, peak expiratory flow rate, inspiratory capacity following diaphragmatic breathing exercise

There is significant improvement in improving chest Expansion, peak expiratory flow rate, inspiratory capacity following neurophysiological facilitation

There is no significant difference between diaphragmatic breathing exercise and neurophysiological facilitation in improving chest expansion,peak expiratory flow rate, inspiratory capacity after 10 days of intervention

9. REFERENCE

- Tidy's physiotherapy pg 375,13th edition [2003]
- Egans fundamendal of respiratory care 8th edition [2003]
- Exercise therapy- Carolyn kisner 5th edition [2007]
- Physiotherapy for respiratory and cardiac problem Jennifer a prior s. ammani 4th edition page 94-204 [2009]
- Geriatric rehabilitation Timothy L, Kauffman, Ph.D., PT., (1999), Publication Churchill Livingston.
- Carolyn mitick [1995] research for pt 2nd edition st Louis newyork
- Donna frown felter and elizebeth dean [1996] principle and practice of cardio pulmonary physical therapy 4th edition mosby, st ouis page 661-663
- Dena n. gardener [1985] the principle of exercise therapy 4th edition
- Guyton [1991] text book of medical physiology 8th edition w.b sunders company page 449- 453
- Scot louis [1995] cardiopulmonary pt 3rd edition mosby st louis page 261-263
- Essentials of clinical geriatrics kane.R ouslander j 15 jan 2009 edition 6
- Primary care of geriatrics Richard j ham Philip d Sloane. Greggh warshaw mosby 2009 4th edition
- Geriatric rehabilitation carole b lewis publication prentice hall 2007
- Ebersole, P and Hers [1998], Towards healthy aging Human needs and nursing response Mosby, St. Louis M.O

- Jacobs R [1981] Physical changes in the aged, in MO Deveraux et al eds, Edly care a guide to clinical geriatrics, Grune and Straffon Newyork.
- Saxon SV and Etten Mj [1994] Physical changes and aging the hiresia press UN, New York.
- Schumann L [1995] Alterations in respiratory functions in LEE capsteded, perspective pathophysiology WB Saunders, Philadelphia.

10. APPENDIX TABLE - I

Group A [chest expansion]

PRE TEST				POST TEST		
S.NO	**AXILLARY**	**NIPPLE**	**XIPHISTERNAL**	**AXILLARY**	**NIPPLE**	**XIPHISTERNAL**
1	1	2	2	3	3	3
2	1	1	1	2	2	2
3	2	1	2	3	3	3
4	1	2	2	3	3	2
5	1	2	2	2	3	3
6	1	2	3	3	3	4
7	1	2	3	2	3	4
8	1	2	1	2	3	3
9	2	3	3	3	4	4
10	1	3	3	2	4	4
11	1	2	2	3	3	4
12	1	2	4	2	3	5
13	1	1	4	3	3	5
14	1	2	2	3	3	3
15	1	2	1	3	3	3

TABLE – II

Group B [chest expansion]

PRE TEST				POST TEST		
S.NO	**AXILLARY**	**NIPPLE**	**XIPHISTERNAL**	**AXILLARY**	**NIPPLE**	**XIPHISTERNAL**
1	2	2	3	3	3	4
2	1	1	2	3	3	3
3	2	2	3	3	3	4
4	1	3	2	2	4	3
5	2	1	2	3	3	3
6	1	3	3	3	4	4
7	1	3	2	2	4	4
8	1	3	2	2	4	4
9	2	2	3	3	3	5
10	2	1	3	3	3	5
11	2	3	3	3	4	4
12	2	2	3	3	3	4
13	1	2	2	3	3	3
14	1	1	3	3	3	5
15	1	1	2	2	3	4

TABLE – III

Group- A (Inspiratory capacity)

INSPIRATORY CAPACITY		
S.No	**PRE TEST**	**POST TEST**
1	2	3
2	1	2
3	1	3
4	2	3
5	1	2
6	1	2
7	1	3
8	1	3
9	1	3
10	1	2
11	1	3
12	1	3
13	1	2
14	2	3
15	1	2

TABLE – IV

Group- B (Inspiratory capacity)

INSPIRATORY CAPACITY		
S.No	**PRE TEST**	**POST TEST**
1	2	3
2	1	2
3	1	3
4	1	3
5	1	3
6	1	3
7	2	3
8	2	3
9	1	3
10	1	3
11	1	2
12	1	3
13	2	3
14	1	3
15	1	3

TABLE – V

Group- A (Peak expiratory flow rate)

PEAK EXPIRATORY FLOW RATE		
SNO	**PRE TEST**	**POST TEST**
1	200	210
2	180	200
3	165	170
4	200	220
5	100	130
6	100	120
7	130	140
8	150	170
9	110	130
10	100	110
11	70	100
12	100	110
13	70	90
14	150	170
15	130	150

TABLE – VI

Group-B (Peak expiratory flow rate)

PEAK EXPIRATORY FLOW RATE		
SNO	**PRE TEST**	**POST TEST**
1	100	110
2	70	90
3	150	160
4	100	100
5	200	230
6	70	90
7	100	100
8	110	130
9	150	170
10	70	90
11	110	120
12	100	110
13	115	130
14	150	160
15	100	120